

THE MANY FACES OF THE CONSTRAINTS IN GENERAL RELATIVITY

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ABSTRACT

In this talk the constraint equations for $[n+1]$ -dimensional (with $n > 3$) smooth Riemannian and Lorentzian spaces satisfying Einstein's equations will be considered. Under some mild topological assumptions it is shown first that whenever the primary space is Riemannian the 'Hamiltonian' and 'momentum' type expressions satisfy exactly the same type of first order symmetric hyperbolic subsidiary system as they do in the conventional Lorentzian case. It is shown then that, regardless whether the primary space is Riemannian or Lorentzian, the constraints can always be put into the form of an evolutionary system comprised either by a first order symmetric hyperbolic system and a parabolic equation or, alternatively, by a strongly hyperbolic system subsided by an algebraic relation. The (local) existence and uniqueness of solutions to these evolutionary systems is also shown verifying thereby that the proposed evolutionary approach provides a viable alternative to the apparently unique conformal method.

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